

**GRANT-PLATTE RIVERS  
STATE OF THE BASIN REPORT**

**VOLUME 3**

**GALENA RIVER WATERSHED  
(GP01)**

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## GP01 Map

## GALENA RIVER WATERSHED (GP01)

The Galena River Watershed lies in southwestern Lafayette County and southern Grant County. It is a large watershed of about 242 square miles. Of the 260 miles of streams in the watershed, 115 stream miles are classified as warm water sport fishery. Thirty-five miles of the Galena River are considered Exceptional Resource Waters (ERW) under state administrative rules. The existing biological uses of about 120 miles of smaller streams in the watershed have not been formally determined.

Four streams in the watershed are on Wisconsin's impaired waters list as required by section 303(d) of the federal Clean Water Act. Those four are Bull Branch, Diggings Creek, Louisburg Creek, and an unnamed tributary to Shullsburg Branch. Diggings Creek and the tributary to Shullsburg Branch are listed due to the continued effects from the mining waste piles in the area. The others are listed due to loss of habitat resulting from non-point sources of pollution.

Overall, the watershed is ranked as a high priority for non-point source pollution abatement needs. In addition, groundwater is considered to have a high potential for contamination.

**Agriculture** - Agriculture is the dominant land use in the watershed. Farm field and barnyard runoff are considered to be major non-point source pollution problem (WDNR, 1979). Another major non-point source pollution problem common in this and other watersheds in the Grant-Platte Basin is over-grazing of stream banks. This practice results in trampled banks, exposed eroding banks, streams becoming wider and shallower, and stream warming. Direct drainage from barnyards is a major source of nutrient loading to surface waters. Drainage from cropland to streams carries eroded sediments which affects instream habitat and fish spawning areas. Nutrients, fertilizers and pesticides attach to soil particles and can further pollute streams.

Two emerging best management practices can be implemented to protect streambanks, instream habitat, water quality and fisheries. One is establishing a natural vegetation stream buffers. This buffer, if not grazed or cultivated will stabilize stream banks, provide habitat, and filter out pollutants which otherwise would reach the stream (Lyons et.al., 2000b).

A second practice which provides a similar result is rotational grazing (Lyons et.al., 2000a). Rotational grazing relies on the rotation of animals from one paddock to a number of others to allow the paddocks to rest and grow vegetation until they are used again. UW-Extension agricultural researchers have found increased benefits to farmers utilizing intensive rotational grazing (Ostrum and Jackson-Smith, 2000).

With a trend toward a greater concentration of animals and a larger volume of waste throughout the Grant-Platte Basin, these types of best management practices are especially important. At least two large-scale animal operations have been proposed in the watershed (Vollrath, 2000). If these facilities are improperly located, designed, and operated, they have the potential to pose a problem for surface and groundwater quality.

**Platteville Ag Stewardship Farm** - Located in the headwaters of this watershed is the Pioneer Ag Stewardship Farm (PASF) operated by the University of Wisconsin-Platteville. PASF is one site of state efforts to uncover ways for farmers to find economical ways of farming while meeting environmental challenges. The main focus of the farm is to conduct systems research, a branch of research examining how the flow of nutrients through a whole farm that using real-

world applications can positively affect the environment, offer economical solutions to problems and maintain and develop positive social perceptions. The goals of the farm are to discover new applications that can offer the farmer both environmental stability and economic viability while complying with environmental regulations and guidelines.

**Urban** - There are four incorporated communities in the watershed with permitted wastewater discharges to surface water. They are **Cuba City** (2,043), **Benton** (903), **Hazel Green** (1,207), and **Shullsburg** (1,268). Each community's wastewater treatment plant is in good operating condition and Benton's plant was newly constructed in 1998. Three other unincorporated communities also have municipal wastewater discharge permits. They are **Kieler**, **Jamestown Sanitary District #2**, **Jamestown Sanitary District #3**, and **St. Clara at Sinsinawa**. Jamestown Sanitary District #3 is going through facilities planning to upgrade their existing system. None of these communities are experiencing rapid urban growth and therefore pose little threat as sources of urban non-point source.

**Non-point Source Priority Watershed Project** - The Galena River watershed was the site of one of Wisconsin's earliest non-point source pollution abatement program priority watershed projects. The goals of the project were to protect water bodies with good or excellent water quality, and to rehabilitate waterbodies degraded by non-point sources of pollution (WDNR, 1978). An assessment of the priority watershed project indicated the project resulted in "little to no improvement on a watershed wide basis" (Kroner, et.al., 1992). The report also reported that non-point source best management practices which were installed were "moderately effective in reducing non-point source pollution and improving water quality" (ibid, 1992). The report listed three factors that were believed to be responsible for the marginal watershed wide improvement. First, there were relatively low levels of participation by landowners. Second, the large size of the watershed was a factor, particularly when considering the lack of participation. Third, the effects of uncontrolled upstream non-point source pollution sources that have the potential to over-shadow any beneficial effects obtained by implemented best management practices (BMPs). The primary lessons learned from the Galena River priority watershed project were that non-point source BMPs work, but that one or two bad uncontrolled upstream sites can negate the water quality improvements of installed BMPs.

**Mining** - The center of historic lead and zinc mining in Wisconsin is in the Shullsburg - Cuba City area. One mine at Shullsburg remains open as a museum and tourist attraction. It is estimated that about 35 abandoned mine sites and 125 mine waste piles are located throughout the watershed (Kroner, et.al., 1992). Most of these mine waste piles are located adjacent to streams or drainage ways that lead to perennial streams. Runoff from abandoned mine waste piles has resulted in fish kills in the past. In addition to the mines and mine waste piles, numerous air and ventilation shafts, perhaps numbering in the thousands, dot the landscape (Webber, 1998). These are also a concern because they offer the potential for pollutants on the land's surface to be transported directly to local groundwater by these shafts.

## **SURFACE WATERS NARRATIVES**

**Apple River** - The Apple River rises in southern Lafayette County, southeast of Shullsburg, and flows southerly into Illinois. Approximately 99.2 percent of the watershed is agricultural. Monitoring done in the 1980's showed that the stream had habitat and water quality problems due to non-point sources of pollution (Fix, 1991). More recent monitoring (Wang, et.al., 1994) has also found that grazing and trampling of banks is degrading riparian areas along the stream.

In addition, some problem barnyards and some terraced fields drain directly to the Apple River and some of its tributaries (Fix, 1998). Little is known about the impact of such direct farm field drainage on fisheries and water quality of the Apple River.

The Apple River was once listed as one of America's most endangered rivers due primarily to the threat of large hog producing operations being proposed in Illinois part of the Apple River sub-watershed (American Rivers, 1998). A study done by USGS on the Apple River shows the stream carries a median unit-area sediment of 209 tons per square mile with a maximum load of 282 tons of sediment per square mile. The same study showed the stream receiving a median unit-area load of 929 pounds of phosphorus per square mile with a maximum loading of 1400 pounds per square mile (Corsi, et.al, 1997).

An endangered species that is very sensitive to water pollution had been found along the Apple River in the early 1980's, however, no recent recorded sightings have occurred (DNR, 1997). The warm water of Biotic Integrity (IBI) for the Apple River, a measure of water quality based on the fish community, indicated only fair water quality (Wang,et.al., ibid). In 1995 and 1996, the macroinvertebrate community of the Apple River was sampled to give a picture of the stream health that ranges from good to poor water quality. Overall, this biotic index, (known as the **Hilsenhoff Biotic Index** or **HBI**), indicated fair water quality. The majority of the macroinvertebrates found in the Apple River were midges which are typically found in higher numbers in streams with significant agricultural non-point source pollution and often suggest ecological disturbances in the stream (Gamman, 1983, Marshall, 1999).

**Bull Branch** – Bull Branch is a tributary to the Galena River in the southwest corner of Lafayette County. The stream is on the state's official impaired waters (303d) list and is not supporting its full biological potential use most likely due to non-point pollution. In 1995 and 1996, the macroinvertebrate community of Bull Branch was sampled. Although the HBI indicated good water quality in the stream, there were very few mayflies, caddisflies and stoneflies present. Nearly 70% of the sampled macroinvertebrates were midges, which indicates ecological disturbance and most likely high non-point pollution from agricultural sources (Gamman, 1983, Marshall, 1999). Additional monitoring on the stream could help to better characterize the problems.

**Coon Branch** - Coon Branch rises near Cuba City and flows southeasterly to its junction with the Galena River. The stream is currently classified as Limited Aquatic Life (LAL) and Limited Forage Fishery (LFF) for three miles of its length. A mining waste pile and a local solid waste disposal site in its headwaters has caused water quality, habitat and fisheries problems in the past, however these problems have since been remediated. Monitoring done in 1994 showed the stream supported a moderately diverse and fairly pollution intolerant macroinvertebrate (aquatic organisms) community. However, there was a scarcity of fish at the monitoring sites and only a few Creek chubs, a very pollution tolerant species. One water chemistry sample showed an elevated level of lead in the water column (Marshall, 1995). High levels of lead in bench soils adjacent the stream have also been reported (Edwards, 2001). Water taken from the stream failed acute and chronic toxicity for one parameter in recent tests (April, 2000). Additional monitoring is needed to assess the nature of water quality problems in this stream. An aquatic species that is very sensitive to water pollution and listed on the state's threatened and endangered species list had been found along Coon Branch near Benton in the early 1980's (DNR, 1997). No current recorded sightings of it have occurred. Cuba City's wastewater treatment plant discharges to a

small tributary to Coon Branch. Population growth rate for Cuba City during the period from 1990 through 1997 was slightly less than 1%.

**Diggings Creek** - Diggings (New Diggings) Creek is a tributary to the Galena River in extreme southwestern Lafayette County. Water quality, instream habitat and fisheries of the stream have been impaired due to a mine waste (roaster) pile adjacent to the stream. The pile contained about 15,000 cubic yards of mine wastes and covered approximately 1.5 acres in a wetland adjacent the stream (WDNR, 1998). In 1995, the DNR undertook a project to remediate this pile which was completed in 1997. The project removed the mine waste material from the streamside site and the site was restored.

DNR staff conducted macroinvertebrate and fish monitoring on the stream above and below the site during the period from 1993 to 1995 (Marshall, 1998). A fairly diverse forage fishery was found. The HBI gave a varied picture of the stream and results ranged from good to poor water quality. Levels of zinc in the water column were elevated but not to the level that affects fish reproduction or diversity. However, the stream failed an acute and chronic toxicity tests for one parameter in April, 2000. It is likely that the presence of other mining waste piles upstream of the site partially mask water quality improvements realized from the remediation project. Additional monitoring of water chemistry, fish and macroinvertebrates, and of the wetlands effort, is needed. Based on the monitoring data, this stream can be classified as being warm water forage fishery (Marshall, 1998).

The community of New Diggings is adjacent the stream. The residents of New Diggings use on-site waste disposal systems for domestic wastewater. Diggings Creek is on the state's impaired waters list as a result of water quality and habitat problems due to mining waste drainage and non-point sources of pollution.

**Galena (Fever) River** - The Galena River rises in western Lafayette County and flows south into Illinois. It is also called the Fever River by local residents, and is identified on recent state highway maps as the Fever. The river is one of the best smallmouth bass streams in southern Wisconsin (Lyons, 1990). The Galena was added to the state's list of Exceptional Resource Waters (ERW) in 1995 in part due to the significance and importance of the smallmouth bass fishery.

Evaluation monitoring done as a follow-up to the priority watershed project indicates that installed BMPs were effective in reducing non-point source pollution. However, other uncontrolled pollution sources may be undoing or at least masking the improvements made by BMP installation (Kroner, et.al., 1992). The river carries excessive sediment loads during and after summer storm events. This sediment is from cropland and streambank erosion (Fix, 1991). As a result, instream habitat, fisheries and recreational uses are still being affected by non-point sources of pollution.

There are a number of abandoned lead and zinc mines and mining waste piles in the Galena Watershed. It is not known what effect, if any, these are having on the river's water quality, instream habitat and fisheries. Past water chemistry grab samples showed no unusual or elevated levels of heavy metals in the water column. Results of recent bio-assays tests also showed no indication of a toxicity problem in the stream (WDNR, 2000).

Index of Biotic Integrity (IBI) monitoring at two sites on the Galena in 1994 showed “fair” and “good” water quality. Instream habitat ratings at the same two sites indicated “good” and “excellent” habitat (Wang et.al., 1994). Fish surveys conducted over five years at one site on the river has shown wide fluctuation in the number of smallmouth bass caught at that site (Wang,et.al., ibid). The variability of the smallmouth bass population has been studied and reported (Forbes, 1989). Macroinvertebrate sampling conducted in 1995 and 1996 found the Galena to have fair water quality with a high percentage of mayflies, caddisflies and stoneflies which can indicate fairly good water quality (Marshall, 1999).

In the spring of 2000, monitoring was conducted on two sites in the river’s headwaters at the Platteville Ag Stewardship Farm (PASF). This macroinvertebrate sampling, just below College Farm Road, found fair water quality. Some mayflies were sampled, but a large percentage of macroinvertebrates were of the order diptera, or two winged flies (WDNR 2000). Baseline sampling conducted in October 2000 determined cool or cold water habitat to be poor or very poor for fish. Habitat evaluations at the sites found very silty conditions, mostly likely due to cropland erosion, streambank pasturing and streambank erosion in the Galena River subwatershed (WDNR 2000). The Illinois Environmental Protection Agency assessed eighteen miles of the Galena River in Illinois. The resource quality in that portion of the river was rated as “good” for nine miles and “fair” for nine miles. Nutrients and habitat alterations were the major causes of impairment. A couple of pollution sensitive aquatic species listed on Wisconsin’s threatened and endangered species list have been found in the Galena River.

The DNR has acquired fishing easements along some reaches of the Galena River for additional public access. Two municipalities, Benton and Hazel Green, operate wastewater treatment facilities that discharge to the Galena River. Hazel Green’s population growth rate between 1990 and the end of 1997 was 0.5%, while Benton’s growth rate during the same period was about 0.6%. This shows that neither community is growing and indicates that urban stormwater and non-point sources of pollution are not considered a major problem.

**Louisburg Creek** – Louisburg Creek is one of two streams that join to form the Menominee River in southern Grant County. It is a spring fed stream that usually runs clear except during storm events. It has historically had abundant forage fish species populations. While the stream has no known smallmouth bass fishery, it appears to have the potential to support juvenile smallmouth or to serve as a nursery for smallmouth bass (Fix, 1991). The stream does have a history of water quality and habitat problems due to non-point sources of pollution and leaking septic systems. The bad septic systems were addressed in the 1980’s with the formation of the Jamestown Sanitary District #3. A small wastewater treatment plant was constructed with a discharge to Louisburg Creek in the 1980’s. This facility has had some operational problems and the sanitary district is looking to upgrade it in 2001 or 2002. The stream is listed on the 303(d) list of impaired waters.

**Madden Branch** - Madden Branch is a tributary to the Galena River in Lafayette County. The stream has a history of water quality problems including runoff event-related dissolved oxygen problems, excessive nutrient loading, and sediment loading. Priority Watershed non-point source project evaluation monitoring indicated that reaches of Madden Branch, which had installed BMPs, had improved instream habitat, particularly for smallmouth bass (Kroner,et.al., 1992). Although the stream shows signs of improvements between 1982 and 1992 as a result of these BMPs, the other uncontrolled non-point sources of pollution to the creek have negated these improvements and continue to cause water quality impairment. A study done by USGS on



Madden Branch near Meekers Grove showed the stream carries a median unit-area load of sediment of 462 tons per square mile with a maximum load of 684 tons of sediment per square mile. The same study showed the stream receiving a median unit-area load of 1,520 pounds of phosphorus per square mile with a maximum loading of 2,290 pounds per square mile (Corsi, et.al, 1997).

**Pats Creek** - Pats Creek is a small tributary to the Galena River in Lafayette County. Pats Creek provides variable yet important spawning and juvenile habitat for smallmouth bass (Forbes, 1989). A study done by USGS on Pats Creek showed the stream carries a median unit-area load (tons per square mile) of sediment of 254 tons per square mile with a maximum load of 309 tons of sediment per square mile. The same study showed the stream receiving a median unit-area load of 1,210 pounds of phosphorus per square mile with a maximum loading of 1,750 pounds per square mile (Corsi, et.al, 1997). While, no recent assessment of water quality or instream habitat conditions has been done the creek is know to suffer from agricultural non-point source pollution problems (Fix, 1991). Land management practices in its sub-watershed need to be improved in order to improve water quality and instream habitat. An aquatic species listed on Wisconsin's threatened and endangered species list has been found in Pats Creek (WDNR, 1997).

**Shullsburg Branch** - Shullsburg Branch is a tributary to the Galena River west of the Village of Shullsburg in Lafayette County and is managed as a smallmouth bass fishery. A number of closed lead and zinc mines are within its drainage area. No recent information exists on whether these mines with their mine waste piles have had or are having any impact of water quality of the stream. However, recent instream water chemistry monitoring indicated elevated levels of zinc in the water column. Follow-up toxicity testing of Shullsburg Branch indicated that water quality problems due to past mining activities may still exist (WDNR, 2000). Stream habitat is also affected by non-point source pollution.

The DNR has acquired some public fishing easements along Shullsburg Branch. The stream flows through Shullsburg, a city of 1,272 people (1997 est.). The population growth rate for Shullsburg between 1990 and the end of 1997 was 2.6%. The Shullsburg wastewater treatment plant discharges to Shullsburg Branch and a tributary to Shullsburg Branch.

**Sinnippee (Sinnapee) Creek** – Sinnippee Creek is a tributary to the Mississippi River in southern Grant County. The Village of Kieler operates a wastewater treatment plant (WWTP) that discharges to the creek. The reach of the stream from the Kieler WWTP outfall downstream to the headwater springs is an effluent channel and is classified as a Limited Aquatic Life (LAL). From the springs downstream to the Mississippi River, the creek is a full fish and aquatic life stream (Schlessor, 1989). In 1998, DNR conducted stream monitoring on a reach of the stream in response to local concerns about the quality of the water and apparent lack of a fish community.

This monitoring was conducted at two sites within a mile of the Kieler wastewater treatment plant discharge site and no fish were found at either site. Natural habitat limitations were the reason no fish were found at the first site. Fish migration barriers in the form of elevated road culverts at road crossings were the apparent reason no fish were found at site two. Aquatic invertebrate sampling indicated good water quality, the predominance of cool water pollution intolerant amphipods and the observation of healthy leopard frogs gave support to the migration barriers being the cause of lack of fish in this reach. The conclusion upon evaluation of the information collected is that two factors, one natural and one man-made, limit potential

biological uses of the stream. The natural limitation is that the stream is wide shallow and flows over bedrock. The human limitation is that road culverts were not set low enough and are now obstructing fish migration into the upper reaches (Marshall and Saltes, 1998). Acute and chronic toxicity tests done in 1998 indicated no toxicity problems (WDNR, 2000).

**Sinsinawa River** - The Sinsinawa River rises in south central Grant County and flows into Illinois. Historically, it has had a good smallmouth bass fishery. In general, the river has good smallmouth bass habitat (WDNR, 1990). The smallmouth bass fishery, however, has periodically been affected by fish kills that can be attributed to manure spills and runoff events that lead to low dissolved oxygen levels (Mason et.al, 1993).

DNR fish surveys, conducted annually between 1989 and 1997 on an 1800 meter reach of the river, have found that the smallmouth bass population can be extremely variable. The greatest evidence of this can be seen by looking at the 1989 to 1991 data. In 1989, 445 bass were collected at this site. In 1990 and 1991, however, zero bass were found at the same site. Since this population crash in the early 1990's, the smallmouth bass population in the Sinsinawa has been slowly recovering and recent field observations indicate the smallmouth bass fishery has improved (Wang, et.al., 1997, Kerr, 1998).

Water quality and habitat best management practices were installed at some locations on the river as part of the priority watershed project in the 1980's. As with other streams in the watershed, water quality improvements due to the BMP installations has been masked by uncontrolled non-point pollution sources. Macroinvertebrate sampling over the years have shown that the Sinsinawa's Hilsenhoff biotic index (HBI) ranges from good to fairly poor (Kroner et.al., 1992; Lillie and Schlessor, 1993). The fair and poor HBI ratings are a sign of indicate significant water quality impairment due to agricultural non-point sources of pollution.

## RECOMMENDATIONS FOR THE GALENA RIVER WATERSHED

### Non-point Source Pollution

- ◆ Grant County and Lafayette County LCD staff, and the DNR, should conduct land and water surveys to identify potential and existing non-point source pollutions problems in the **Galena River** watershed. This could be used to make a recommendation on all or parts of the watershed for possible inclusion into non-point source pollution abatement programs such as the Targeted Runoff Management (TRM) or EQIP programs.

### Groundwater Contamination

- ◆ The DNR and other units of government should inventory and locate for inclusion in a GIS data base all abandoned mines, mining waste piles and air shafts associated with historic mining in the **Galena River watershed**.

### Protecting and Improving Water Quality and In-Stream Habitat

- ◆ The DNR, including the assistance of Integrated Science Services staff, should conduct baseline monitoring on the **Galena River, Sinsinawa River, Madden Branch, Pats Creek, Scrabble Creek, Shullsburg Branch** and the **Apple River** to assess current status of instream habitat, macroinvertebrate communities, and fish communities.

- ◆ The DNR should monitor **Coon Branch** and **Diggings Creek** to determine if elevated levels of heavy metals are still present in the water column. Sediment sampling and fish toxicity sampling should also be done.
- ◆ The DNR should conduct additional monitoring and follow-up investigations on **Shullsburg Branch** to determine if zinc or mine waste is causing water quality problem in the stream. If the stream is found to have a water quality problem due to past mining practices, it should be considered for addition to Wisconsin's 303(d) list of impaired streams.
- ◆ The DNR should review the stream and stream segments in the **Galena River Watershed** currently on the state's 303(d) list of impaired waters for appropriateness of their inclusion on the list before the 2002 revision of the state's 303(d) list.
- ◆ The DNR should monitor the following streams to track the status of state endangered and threatened species and state species of concern: **Apple River, Coon Branch, Galena River, Bull Branch, Pats Creek, and the Menominee River**
- ◆ The DNR, in partnership with local governmental agencies and local conservation groups, should identify opportunities to better protect riparian habitat on reaches of the **Galena River, Sinsinawa River, Menominee River, Shullsburg Branch and Madden Branch** and any other streams in the watershed.
- ◆ The following streams should be monitored and considered for addition to the impaired waters 303(d) list in the year 2002 due to habitat impairment from sediment: **Apple River, Coon Branch, Fair Play Creek, Madden Branch, Pats Creek, Shullsburg Branch, and Sinsinawa River**. An assessment should be made to determine what action could help improve these streams.

### **Outdoor Recreation, Wildlife Habitat and Protecting Open Space and Farmland**

- ◆ The DNR, in partnership with local governmental agencies and local conservation groups, should identify opportunities to better provide public access on reaches of the **Galena River, Sinsinawa River, Menominee River, Shullsburg Branch and Madden Branch** and any other streams in the watershed.
- ◆ Lafayette County and local outdoor groups, with the assistance of the DNR, should investigate the desirability of developing a canoe trail on the **Galena (Fever) River** as a means of promoting local tourism.
- ◆ The villages of **Benton and Hazel Green**, and the cities of **Cuba City and Shullsburg** should take advantage of opportunities to provide public open space, recreation and access in the riparian areas along the Galena River in their communities.
- ◆ The DNR should encourage the establishment of open space buffers around **Hardscrabble Natural Area** through educational and financial incentives.

- ♦ The DNR should develop and implement a management plan for smallmouth bass fishery of the **Galena River, Sinsinawa River, Menominee River, Shullsburg Branch and Madden Branch.**